Optimizing Pregnancy and Delivery Management In Women With Epilepsy: An Evidence-Based Narrative Review

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ABSTRACT

Background: Pregnancy in women with epilepsy requires simultaneous prevention of maternal seizures and reduction of fetal exposure to potentially teratogenic antiseizure medications (ASMs). Decisions made before conception, altered drug clearance during gestation, and continuity of treatment during labour all influence outcomes. Objective: To synthesize contemporary evidence and develop a practical, stage-specific approach to pregnancy and delivery management in women with epilepsy. Methods: A focused narrative review was undertaken using major clinical guidance from the American Academy of Neurology, American Epilepsy Society and Society for Maternal-Fetal Medicine (2024), Royal College of Obstetricians and Gynaecologists guidance, and selected prospective pregnancy-registry and cohort studies. This was not a systematic review or meta-analysis. Results: Available evidence favours individualized preconception planning and, when clinically appropriate, monotherapy with lamotrigine, levetiracetam or oxcarbazepine. In the 2024 EURAP report, major congenital malformations occurred in 2.5%, 3.1% and 2.9% of pregnancies exposed to levetiracetam, lamotrigine and oxcarbazepine monotherapy, respectively, compared with 9.9% following valproate monotherapy. Pregnancy-related reductions in ASM concentrations require targeted surveillance and individualized dose adjustment. Vaginal delivery is generally appropriate, and planned postpartum dose reassessment and support for breastfeeding are important. Conclusion: A multidisciplinary, longitudinal care pathway prioritizing seizure control, informed prescribing, therapeutic monitoring and coordinated childbirth planning is the most defensible optimization strategy. Prospective trials are still needed to establish the effect of individual pathway components.

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Introduction

Epilepsy is among the most common chronic neurological conditions encountered in obstetric care. Although most women with epilepsy can anticipate a successful pregnancy and a healthy infant, clinical management is complicated by interactions between seizures, antiseizure medication exposure, physiological changes of pregnancy and obstetric risk. The central challenge is not simply to avoid medication exposure: insufficient seizure control, especially generalized tonic-clonic or focal-to-bilateral tonic-clonic seizures, can endanger both the pregnant woman and fetus [1,2].

Consequently, treatment optimization should be defined as the achievement of the best attainable balance between maternal seizure prevention and fetal safety, rather than indiscriminate reduction or withdrawal of ASMs. The 2024 collaborative practice guideline from the AAN, AES and SMFM emphasizes the prevention of convulsive seizures and selection of medication before conception whenever possible [1]. Existing obstetric guidance also supports individualized birth planning and avoids routine operative delivery solely because epilepsy is present [2,3]. This review synthesizes these principles into a practical continuum of care extending from prepregnancy counseling through the postnatal period.

Review Approach and Evidence Base

This is a focused, non-systematic narrative review, structured around clinically relevant decisions: preconception optimization, comparative medication safety, pharmacokinetic monitoring, antenatal assessment, labour and delivery, and postpartum management. Priority was given to professional-society guidelines and large prospective registries. Quantitative malformation estimates are reproduced from the EURAP observational analysis rather than pooled or recalculated [4]. Additional evidence derives from the MONEAD cohort and contemporary research on breastfeeding [5,6]. Because no predefined search strategy, risk-of-bias assessment or exhaustive screening was performed, the article should not be interpreted as a systematic review or a new clinical trial.

Preconception Counseling and Risk Stratification

Preconception consultation provides the greatest opportunity for preventive intervention because organogenesis begins before many women recognize pregnancy. A joint neurology-obstetrics review should document epilepsy syndrome, seizure semiology, history of convulsive seizures, recent seizure frequency, previous status epilepticus, adherence, medication tolerability, reproductive goals, psychiatric comorbidity and previous

pregnancy outcomes. A review of current therapy is especially relevant for patients taking valproate, phenobarbital, topiramate or complex polytherapy [1,2].

Whenever efficacy permits, treatment should be simplified to the lowest effective dose of an appropriate monotherapy before conception. This principle is conditional: a woman who remains seizure-free only on a particular regimen may face substantial harm from destabilization. Changes should therefore be supervised by a specialist and completed sufficiently early to evaluate seizure control. A useful reference serum concentration may be obtained before pregnancy when levels are clinically informative, particularly for lamotrigine and levetiracetam [1,5].

Folic acid should be started before conception. The 2024 AAN/AES/SMFM guideline recommends at least 0.4 mg daily before and during pregnancy for women taking an ASM; higher-dose policies differ by jurisdiction and should be individualized rather than assumed universally beneficial [1]. Counseling should include sleep regularity, avoidance of missed doses, medication interaction review, contraception during treatment transitions, and a documented seizure-response plan. Shared decision-making is especially important when effective therapy carries a known fetal risk.

Comparative Fetal Safety of Antiseizure Medications

Evidence from pregnancy registries demonstrates marked differences in the frequency of major congenital malformations (MCMs) across ASMs. The EURAP study published in 2024 included 10,121 eligible prospective pregnancies exposed to monotherapy, with 9,840 pregnancies represented in its eight-drug principal analysis [4]. The absolute risks below describe registry-observed associations and are not randomized estimates of the causal effect of a medication. Differences in underlying epilepsy syndromes, dosing and selection of treatment may influence comparisons.

Table 1. Major congenital malformations following ASM monotherapy in EURAP [4].

ASM	Exposed pregnancies	MCM, n	MCM % (95% CI)
Levetiracetam	1,325	33	2.5 (1.8-3.5)
Oxcarbazepine	443	13	2.9 (1.7-5.0)
Lamotrigine	3,584	110	3.1 (2.5-3.7)
Topiramate	204	10	4.9 (2.7-8.8)
Carbamazepine	2,255	121	5.4 (4.5-6.4)
Phenobarbital	338	21	6.2 (4.1-9.3)
Phenytoin	142	9	6.3 (3.4-11.6)
Valproate	1,549	153	9.9 (8.5-11.5)

The lowest observed MCM prevalences were reported with levetiracetam, oxcarbazepine and lamotrigine. The analysis also identified dose-associated increases in risk for valproate, phenobarbital and carbamazepine; notably, lower doses of valproate did not eliminate excess risk [4]. Valproate exposure is additionally associated with adverse neurodevelopmental outcomes, and guideline authors recommend avoiding it when clinically feasible, particularly before conception [1]. Topiramate also warrants caution because of fetal growth and specific malformation concerns. Nonetheless, an established pregnancy should not prompt abrupt withdrawal of an effective ASM; uncontrolled convulsive seizures may create immediate harm [1].

Individual treatment choice must take epilepsy syndrome into account. A drug with relatively favourable pregnancy registry outcomes may be unsuitable or ineffective for some generalized epilepsy syndromes. Lack of robust pregnancy data for newer ASMs should not be conflated with proven safety. Clinicians should explicitly communicate both established risks and the uncertainty surrounding less-studied agents [1,7].

Pharmacokinetic changes and therapeutic drug monitoring

Gestation alters renal clearance, plasma volume, protein binding and hepatic drug metabolism. The clinical consequences depend on the ASM. Lamotrigine clearance can increase considerably, and levetiracetam concentrations also commonly decline; reductions in dose-normalized concentrations have additionally been documented for oxcarbazepine, lacosamide and zonisamide [5]. In MONEAD, serial sampling showed significant pregnancy-related declines for several contemporary ASMs, illustrating why a stable prescribed dose does not necessarily imply stable exposure [5].

Monitoring should integrate seizure history, adverse effects, adherence, gestational age and, when feasible, serum drug measurements compared with the individual woman's effective prepregnancy concentration. The 2024 guideline recommends monitoring ASM levels during pregnancy according to pharmacokinetics and clinical presentation, and considering dose adjustment when concentrations decline or seizure control worsens [1]. A universal concentration threshold or fixed testing interval cannot reliably substitute for individual assessment. More frequent assessment may be needed after a breakthrough seizure, vomiting, suspected nonadherence, dose change or substantial measured decline.

After delivery, pregnancy-related clearance changes reverse, potentially causing elevated drug concentrations if

gestational dose increases are continued unchanged. Planning should therefore include an explicit postpartum dose-reduction and clinical or laboratory reassessment schedule before discharge. Rapid restoration to a prepregnancy regimen may be appropriate for some agents, but timing must be individualized to avoid toxicity or recurrent seizures [5].

Antenatal Follow-Up and Prevention of Complications

Integrated antenatal care should distinguish the consequences of epilepsy itself from those of medication exposure and coexisting obstetric disease. Standard ultrasound screening for structural anomalies remains essential, with targeted evaluation guided by specific exposure history and local fetal-medicine protocols. Serial fetal-growth assessment may be considered according to the medication regimen and additional risk factors. Neither seizure freedom nor a reassuring early scan completely excludes drug-associated developmental outcomes [1-3].

At each visit, the care team should ask specifically about convulsive and nonconvulsive seizures, medication adherence, morning sickness, sleep deprivation, falls, injuries, anxiety and depressive symptoms. Persistent vomiting and inability to retain ASM doses may necessitate prompt reassessment. Women and families should receive practical injury-prevention guidance, including safer bathing arrangements and escalation instructions for prolonged seizures. A new seizure in late pregnancy requires consideration of alternative diagnoses, particularly eclampsia, rather than automatic attribution to established epilepsy [2,3].

Seizure-related maternal risks include trauma, aspiration and the potential for status epilepticus; fetal risks may arise through maternal hypoxemia and transient compromise of uteroplacental perfusion. The evidence is strongest for the imperative to prevent convulsive seizures, while precise causal estimates for individual obstetric outcomes remain affected by confounding [1]. An individualized maternity care plan should be shared between the epilepsy team, obstetrician, anesthesia service and relevant neonatal clinicians.

Intrapartum Management and Mode of Delivery

Epilepsy, when adequately controlled, is not in itself an indication for elective caesarean delivery or induction. Vaginal birth is appropriate for most women, and the mode and timing of delivery should primarily follow obstetric indications [2,3]. The anticipated seizure risk during labour is generally low, particularly with stable seizure control, but disruption of routine treatment, exhaustion, prolonged fasting and sleep deprivation can increase vulnerability. Staff should review the seizure plan on admission, preserve scheduled oral doses where possible and establish an alternative route when oral administration is not feasible.

Good intrapartum practice includes hydration, adequate analgesia, avoidance of prolonged sleep deprivation, and rapid access to emergency treatment. Neuraxial analgesia is not routinely contraindicated because of epilepsy and may lessen pain-related stress when appropriate. Management should be multidisciplinary for women with frequent convulsive seizures, recent status epilepticus or substantial obstetric comorbidity [2,3]. A seizure during labour requires immediate maternal stabilization, airway and breathing assessment, positioning to reduce injury or aspiration risk, glucose assessment and urgent obstetric/anesthetic review. Prolonged or recurrent seizures are managed according to an institutional emergency protocol; fetal assessment follows maternal stabilization.

Distinguishing an epileptic seizure from eclampsia is critical when hypertension, headache, visual disturbance, proteinuria or other obstetric warning signs coexist. Magnesium sulfate is first-line therapy for eclamptic seizures and should not be replaced by routine outpatient ASM management [2]. Delivery decisions after an intrapartum seizure depend on fetal status, maternal recovery, seizure recurrence and the underlying cause—not on epilepsy alone.

Postpartum management, breastfeeding and neonatal care

The immediate postpartum period combines rapid pharmacokinetic change, fragmented sleep, psychosocial demands and possible difficulty adhering to a medication schedule. Women whose ASM dose increased during pregnancy require a clear and documented reduction or reassessment plan. Family support with night-time infant care can protect sleep and reduce missed treatment. Safe infant handling should be discussed without discouraging maternal caregiving: precautions may include feeding while seated, avoiding bathing the infant alone when seizures are uncontrolled, and ensuring another adult is available during high-risk periods [2,3].

Breastfeeding should generally be supported with individualized review of the prescribed regimen and monitoring for infant sedation, poor feeding or inadequate weight gain where relevant. Recent prospective MONEAD follow-up involving 262 children of women with epilepsy and 80 comparator children found no evidence that breastfeeding while mothers used contemporary ASM regimens was associated with poorer measured neurodevelopment at six years; breastfeeding for at least six months was associated with higher adaptive behaviour scores, although the observational design does not establish causality [6]. This evidence supports counseling against blanket avoidance of breastfeeding solely because an ASM is prescribed.

Before discharge, patients should receive coordinated instructions concerning prescribed doses, follow-up appointments, seizure-emergency thresholds, contraception, potential medication-contraceptive interactions and postpartum mental-health assessment. The newborn should receive standard pediatric assessment with targeted review when prenatal exposure or clinical symptoms warrant further evaluation.

Proposed stage-specific optimization pathway

Table 2 translates the synthesized recommendations into a care framework. It is a proposed clinical workflow, not an intervention tested as part of this review.

Table 2. The synthesized recommendations into a care framework. It is a proposed clinical workflow, not an intervention tested as part of this review.

Stage	Priority assessment	Recommended care action
Before conception	Syndrome, convulsive seizure history, ASM risks, reproductive plans	Specialist review; select effective lower-risk regimen when feasible; folic acid ≥0.4 mg/day; record reference ASM level if useful.
Early pregnancy	Medication exposure, seizures, adherence, nausea/vomiting	Avoid abrupt ASM withdrawal; arrange joint obstetric–neurology follow-up; confirm surveillance plan.
Mid/late pregnancy	Seizure control, ASM concentrations, fetal growth/anatomy	Individualized dose monitoring and adjustment; appropriate ultrasound follow-up; documented seizure action plan.
Labour and birth	Recent seizures, dose schedule, obstetric indication	Continue ASMs; minimize missed doses, exhaustion and dehydration; vaginal birth unless obstetric indication otherwise.
After delivery	Drug clearance reversal, sleep, infant care	Plan postpartum ASM dose reassessment; support breastfeeding and safe caregiving; ensure timely follow-up.

Discussion

The evidence suggests that the largest opportunity to improve care is the coordination of decisions across reproductive stages. First, preconception selection of a suitable ASM may reduce fetal risk without sacrificing seizure control. Second, pregnancy-specific therapeutic surveillance can mitigate loss of seizure protection associated with falling drug concentrations. Third, a practical labour plan prevents treatment interruption and supports an appropriate mode of birth. Finally, postpartum dose adjustment and breastfeeding counseling address risks that are frequently overlooked when clinical attention shifts to the newborn [1-6].

A central clinical trade-off is illustrated by valproate. Registry and guideline evidence identify a comparatively high teratogenic and neurodevelopmental burden, making avoidance before pregnancy desirable whenever possible. However, a woman who becomes pregnant while effectively treated with valproate should receive urgent specialist counseling rather than abrupt cessation, because the maternal and fetal consequences of uncontrolled convulsive seizures must also be considered [1,4]. This distinction between preconception prevention and management after conception is essential to safe care.

The numerical MCM rates in Table 1 should not be construed as personalized probabilities. The EURAP data are observational and monotherapy-specific; confidence intervals, dose dependence, epilepsy phenotype and potential confounding need to be considered. The same caution applies to postpartum breastfeeding associations: comparable outcomes after breastfeeding are reassuring but do not demonstrate that exposure via milk is uniformly safe for every drug or infant [4,6]. A 2025 systematic review of 14 guidelines reported consensus on avoiding valproate when possible, folate, vaginal delivery and breastfeeding, but highlighted variation in monitoring and folate-dose recommendations [7].

Implementation barriers may include limited access to drug assays, specialist appointments and standardized multidisciplinary protocols. In such settings, consistent clinical seizure surveillance, a reliable medication supply and clear emergency instructions remain valuable even when sophisticated monitoring is unavailable. Local adaptation should specify referral thresholds, laboratory availability and responsibilities for postpartum medication review. Future studies should assess patient-centred outcomes, seizure-related emergencies, medication toxicity, birth experience, developmental follow-up and health-system feasibility using prospectively defined measures.

Limitations

This manuscript is a narrative synthesis rather than a systematic review, with selective inclusion of influential sources and no formal certainty-of-evidence grading. It provides no original cohort, no new statistical analysis and no estimates of effectiveness for the proposed care pathway. Evidence on newer ASMs, individual analgesia strategies and several perinatal outcomes remains limited. Institutional protocols and national regulatory requirements may differ from the professional guidelines discussed. These limitations should be considered before clinical implementation or journal submission.

Conclusions

Optimizing pregnancy and delivery in women with epilepsy requires continuous risk management rather than isolated obstetric decisions. Preconception medication review, avoidance of higher-risk ASMs when clinically feasible, prevention of convulsive seizures, individualized therapeutic drug monitoring, obstetrically appropriate delivery planning and proactive postpartum reassessment form a coherent evidence-based care model. Most women

with well-controlled epilepsy can pursue vaginal delivery and breastfeeding. The most important safeguard is timely collaboration between neurology, obstetrics, anesthesiology, neonatal services and the patient, supported by individualized counseling and uninterrupted effective treatment.

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